

THE PANORPOID COMPLEX.

ADDITIONS AND CORRECTIONS TO PART 3.

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(With one Text-figure.)

During my recent visit to New Zealand, I was fortunate in obtaining fairly plentiful supplies of the larvae and pupae of a Thyridid moth, *Morova (Siculodes) subfasciata* (Walk.). The dissection of the pupal wings of this species has enabled me to fill in one of the gaps in the evidence in Part 3 of this work.

This moth lays its eggs, which are flat, circular, fringed discs, somewhat similar to the Tortricid type, on the stems of the *Parsonsia* vines which are found commonly in the bush throughout both North and South Islands. The young larva bores into the stem, and feeds there, causing a noticeable swelling in it. It pupates in its own tunnel in the stem.

The imago is not unlike *Rhodoneura scitaria* in appearance, but the forewings are distinctly falcate at their tips. The genus *Morova* differs from *Rhodoneura* in having M_1 of the hindwing not directly connected with R_s , but joined to it through the cross-vein *m-r*, while in the forewing it has R_3 and R_4 anastomosing, the cross-vein *ir* being absent. In these characters, as Dr. A. J. Turner has pointed out to me, this genus resembles the Australian genus *Addaea* very closely.

In view of the above differences, it seems scarcely necessary to figure the imaginal venation of *Morova subfasciata* here. Reference should be made to Text-fig. 98 on p. 677 of Part 3 (these Proceedings, xlv., 1919, part 3), where the imaginal venation of *Rhodoneura scitaria* is shown.

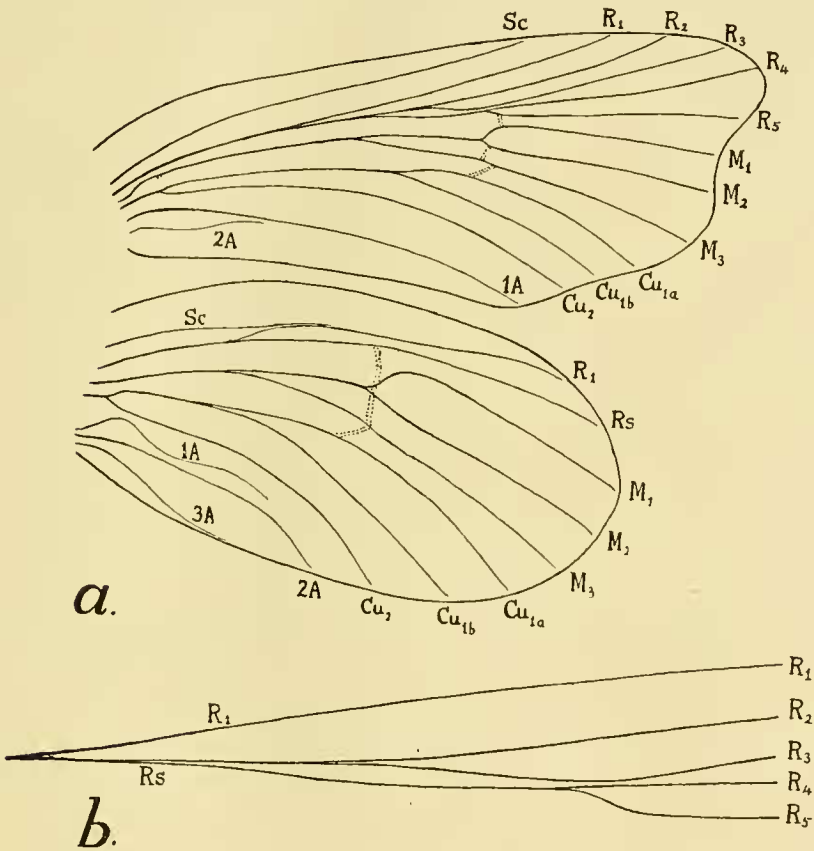
Text-fig. 113 shows the pupal tracheation, as drawn by me from dissections made from pupae taken on January 1st of this year in the Woodhaugh Gardens, Dunedin. For help in obtaining these specimens I am much indebted to my friends, Mr. G. Howes and Mr. C. Clarke, of that city.

The chief point of interest in the forewing is the condition of the radius and its sector, which is shown enlarged in Text-fig. 113 *b*. There is only a single radial sector, which forks in the normal Heteroneurous manner; the radial cell, or areole, is present, but exceedingly narrow, and is not closed distally. The condition in the imago, in which R_4 anastomoses with R_3 , is evidently due to the suppression of the main stem of R_{4+5} , and the non-development of the cross-vein *ir*. Comparing the imaginal conditions of this region in *Morova* and *Rhodoneura*, we are able to deduce from this that, in *Rhodoneura* pupal wings, the condition of the radial sector of the forewing would be the typical one found in the Tortricina and many Tineina, viz., a single R_s with an areole formed between its two branches, this areole being closed distally by *ir*. Further consideration shows us that, in *Rhodoneura*, as in *Morova*, the main stem of R_{4+5}

does not ebitinise in the imago; and hence the cell of the forewing is a true *areocele* of the Tortricid type.

Thus this portion of the forewing indicates some affinity with the Tortriciina, as does also the form of the egg.

The contrast between the form of the radial sector of the forewing in *Morova* and in the Butterflies can be noted at once by comparing Text-fig. 113 with Text-figs. 99 and 101 of Part 3 of this work already referred to. I think that this character alone should put out of court any suggestion that the *Thyrididae* can possibly be ancestral to the Butterflies. It is only in the *Cossidae*, the oldest ex-



Text-fig. 113.

Morova (Siculodes) subfasciata (Walk.), (fam. *Thyrididae*). *a*, tracheation of pupal wings (x 18). *b*, the condition of the radial trachea and its sector in the forewing, further enlarged (x 45).

isting family of Heteroneura, that we find conditions at all approximating to those of the Butterflies with respect to the separation of R_s into two stems arising well apart from R₁. This should incline us to look for the origin of the Butterflies much further back, almost certainly in some group that has long ago become extinct, and has left no very close relatives existing to-day.

Another point of interest in the forewing is that Cu_1 forks very far distad, well beyond the level of the forking of $M_{1.4}$. This should be compared with the condition to be seen in *Euschemon*, where the fork of Cu_1 is placed much nearer to the base; and, consequently, in the imago, Cu_{1a} and Cu_{1b} leave the areoel much further apart than they do in the *Thyrididae*. There can be little doubt that the condition to be seen in *Euschemon* and in other Butterflies is the more primitive of the two.

In dissecting the forewing of the pupa of *Morova*, I looked carefully for the trachea 3A, but failed to find it. This trachea is quite easily seen in the pupal wing of *Euschemon*. Thus there is here a third character in which the *Thyrididae* are more highly specialised than the oldest forms amongst the Butterflies.

In the hindwing, trachea R_1 is dominant over trachea Sc , as in the Tortricid *Carpocapsa* (Part 3, p. 665, Text-fig. 89) the Oecophorid *Wingia* (Part 3, p. 666, Text-fig. 90), and the Butterfly *Euploea* (Part 3, p. 685, Text-fig. 101), but not as in *Euschemon* (Part 3, p. 680, Text-fig. 99), where the reverse is the case. This character is not, however, of much importance, as we do not yet know how variable it may prove to be in the different families. Of more interest is the absence, in *Morova*, of any sign of a humeral veinlet in the hindwing. Such a veinlet is to be seen in the pupal wings of many Butterflies.

The very strong arching up of M_1 towards R_s in the hindwing of *Morova* appears to be a somewhat more specialised condition than that found in *Euschemon*.

The anal area of the hindwing in *Morova* is of very great interest. The pupal tracheation fully confirms my original interpretation of the anal veins in the imago of *Rhodoneura*. Trachea 1A is present in the pupal wing, in much the same condition as in the Cossid *Xyleutes* (Part 3, p. 661, Text-fig. 87), but slightly more specialised by reduction, in that it fails to reach much more than half-way towards the wing-border. It has, as in *Xyleutes*, lost its original contact with Cu_2 , and makes a strong downward curve towards 2A, without actually coming into contact with it. In the imago, 1A and 2A become fused, thus forming the basal anal Y-vein shown in Text-fig. 98.

This condition is much more primitive than that to be seen in the pupal hindwings of Butterflies, where 1A is completely absent, and consequently there is no basal anal Y-vein present. It would seem to indicate a close connection between the *Thyrididae*, and the more primitive types of Heteroneura, in which trachea 1A is preserved in much the same condition.

Trachea 3A is present in the pupal hindwing of *Morova*, as in that of the Butterflies, and becomes chitinised in the imaginal venation. Trachea Cu_2 is also present in the pupal hindwings of both groups, but fails to become chitinised in the Butterflies, though it is sometimes partially and very feebly indicated in the imagines of *Thyrididae*.

To sum up, then, there are three characters in the forewing of the *Thyrididae* which are more highly specialised than the corresponding conditions to be found in the oldest Butterflies. The hindwing, on the other hand, is in most respects more archaic than that of the Butterflies.

We may conclude from this that, while there are obvious affinities between the *Thyrididae* and the older groups, especially the Tortricina, and also between the *Thyrididae* and the *Pyralidae* (though the pupal wings of this latter family still remain to be studied), yet there is no evidence that the *Thyrididae* stand in any direct ancestral line to the Butterflies, as Meyrick and Hampson have averred. There is, on the contrary, very distinct evidence, in the form of three characters

in the forewing, against this claim. The proper degree of relationship between the *Thyrididae* and the Butterflies is probably best expressed if we say that the old Protocossid stem gave origin in ascending order to (a) the Zygaenoid group of families (Meyrick's superfamily Psychina), (b) the Pyraloid group of families, of which the most archaic, having very distinct affinities with the Tortricina is the *Thyrididae*, though these are not even to be considered as *directly* ancestral to the *Pyralidae* themselves, and (c) the Rhopalocera, as a very distinct series whose origin is to-day lost to us.

At this stage we must leave this interesting problem, until such time as pupae of the *Zygaenidae* and *Pyralidae* can be obtained and their wings studied with a view to obtaining further light upon it. Sufficient evidence has, however been obtained to show the extreme unlikeliness of any existing Heteroneurous type representing even a close approximation to the original archetype of the Rhopalocera.

CORRIGENDA TO PART 3.

- p. 561, line 14 from bottom, for "one" read "two."
- p. 588, for "Text-fig. 53" read "Text-fig. 58."
- p. 594, remove the Lepidoptera from (C) to (D).
- p. 623, interchange lines 26 and 27.
- p. 635, in Table II., to the characters given under (4) add "veinlet *dec.*"
- p. 647, line 19, for "Homoneura" read "Heteroneura."
- p. 650, in last line, the percentage for *Hepialidae* should be 57.5, and that for *Prototheoridae* 32.5.
- p. 676, lines 3, 7, and 14, for "1A" read "2A," as in Text-fig. 97.
- p. 682 and p. 686, in Text-figs. 100 and 102, in hindwing, for "acl" substitute "bc"=basal cell. There is no true areocele in the hindwing.
- p. 685, line 6 from bottom, complete the bracket after "*Euschemon*."
- p. 689, lines 4 and 5 from bottom, the percentage for *Hepialidae* should be 68.5, that for *Prototheoridae* 50.0.
- In Text-fig 110, the forks of R_{4+5} , M_{1+2} and M_{3+4} should be labelled p. 701, line 2 for "M" read " M_3 ".
- x, y, z, respectively, to conform with the text.
- p. 707, in Table V (2), under Lepidoptera, for "C" read "D".
- p. 708, in the Phylogenetic Diagram, for "CRETACEOUS" read "CRETACEOUS", and alter the bracket for "Sialoidea" so as to enclose only the *Sialidae* and *Corydalidae*.
- p. 711, line, 13, for "evolutions" read "evolution".
- p. 717, in the explanation of Plate xxxi., fig. 16, for "The arrows point to" read "The arrow indicates the position of".

I have to thank my friend Mr. A. Philpott, of Invercargill, N.Z., for reading through Part 3 very carefully several times, and thus discovering a number of the above errors.